ARAT Bulletin
Electronic Combat

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Armed Forces Day

Live Armed Forces Day Reprogramming Demonstration at Ft. Monmouth

*By Jim Holland, SRI International
and Andrew Lombardo, L-3 Communications Corp. – Ilex Systems*

*A*RMED FORCES DAY, MAY 15, 1999, FT. MONMOUTH, NJ—Unaware of what was about to occur, scores of military personnel and civilians scamper around the static displays at Fort Monmouth's Armed Forces Day. Children eager to get a glimpse of the inside of an M-60 tank or an Apache helicopter wait in line impatiently behind their peers. Suddenly, an announcement pierces the bustling airwaves: "In five minutes, a Cobra helicopter will be landing on the field to participate in a live Software Reprogramming demonstration." Above the Post Chapel, a small, black dot slowly becomes visible to everyone attending. Within minutes, a Cobra helicopter from the New Jersey Army National Guard circles Greeley Field twice before landing, amidst the exclamations of excited kids eager to check out the latest marvel. Immediately after the Cobra lands, two experienced pilots, MAJ Dennis Devery and CW2 Art Johns, jump out to secure the helicopter's rotary blades as they come to a halt.

Reprogrammed Cobra taking off to next mission

The stage was set for the Communications–Electronics Command (CECOM) Software Engineering Center's (SEC) live demonstration of the rapid software reprogramming process currently used by U.S. Army forces deployed worldwide.

Cooperating . . . This Means You!

By Joseph Ingrao, ARAT Project Officer

Getting extraordinary things done in organizations and units is everyone's business. At the ARAT Project Office, we passionately promote teamwork as the interpersonal route to success—particularly when the conditions are extremely challenging and urgent, as they are in today's armed forces. In collaborating with field units, development contractors, government agencies, EWOs, and many other entities, we realize that we are successful only when U.S. Warfighters succeed and are oriented toward aiding each other to perform effectively. In all of our past efforts, we have not encountered a single example of extraordinary achievement that occurred without the active involvement and support of many in the U.S. Armed Forces.
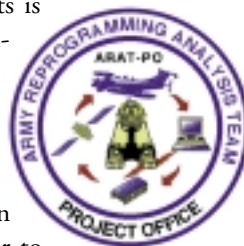
Our mission has always been to support the soldiers. In doing so, we must always develop cooperative goals with the Warfighter. Only as individuals working jointly toward a shared goal can we be successful.

We want your inputs, ideas, and goals. The CECOM Software Engineering Center (SEC) will use your ideas to maintain and develop the best infrastructure to support military operations.■

AN/APR-39A(V)2 MLV Reprogramming Kit Initiated

By Jon Cory, SRI International

Memory Loader/Verifier (MLV) reprogramming kits for the AN/APR-39A(V)2 are in the early development stage. This R&D task, sponsored by the Army Reprogramming Analysis Team Project Office (ARAT-PO), is intended to provide low-cost MLV reprogramming kits similar to those the U.S. Army uses for the AN/APR-39A(V)1. Once completed, a few of these kits will be distributed to the Navy for field testing and evaluation. The current MLV reprogramming kits support the AN/APR-39A(V)1/3/4, so completion of this R&D task will give the ARAT-PO MLV reprogramming kits to support the entire AN/APR-39A(V) family.

The current reprogramming concept for the AN/APR-39A(V) family uses ruggedized laptops as the MLV in the field. For the AN/APR-39A(V)1/3/4, the only other requirement is the MLV software and the interface cable that comes in the MLV reprogramming kit. For the AN/APR-39A(V)2, a new software module will be added to the MLV software and a new interface cable will be designed. We also anticipate that a MIL-STD-1553B PCMCIA card will be needed to provide the communications interface.■

New Servers, Workstations, and Software as R^{2}CIL Readies for the Next Century

*by Mike Crapanzano, L-3 Communications Corp. – Ilex Systems*

The Rapid Reprogramming Communication Infrastructure Laboratory (R^{2}CIL) will be undergoing a major infrastructure upgrade over the next several months. The ARAT Project Office has funded this endeavor to enhance the quality and level of communications support the Laboratory provides to the Warfighter, as well as to ensure its state-of-the-art communications capabilities into the 21st century.

The current server backbone used to support the ARAT presence on both the NIPRNET (Non-Secure Internet Protocol Router Network) and the SIPRNET (Secure Internet Protocol Router Network) is being changed from UNIX SPARCstation™ technology to Dell PowerEdge™ NT servers. These high-performance servers will ensure improved performance and reliability for the Warfighter. The servers, which have built-in redundancy features, will employ RAID (Redundant Array of Inexpensive Drives) technology to ensure consistent performance despite potential hard-drive downtime. Other redundancy features will include un-interruptible power supplies with the ability to notify the R^{2}CIL staff in case of power or system downtime. The classified network backbone will be upgraded from 10 Mbps to 100 Mbps Ethernet for faster network performance. All data on the systems will be backed-up using automated backup software to an Exabyte tape library. The library will have the capability to perform daily backups on a seven-day rotation. The goal is to ensure system readiness on a 24-hour-a-day / 7-day-a-week basis.

The upgrade will also include Microsoft NT workstations with the latest software and web development tools that incorporate new technologies for increased performance. Additional user stations will be installed to support on-site user access to SIPRNET resources. New development software has also been purchased to enable state-of-the-art network monitoring and web development residing on the ARAT network.

Finally, beginning this year, STEs (Secure Terminal Equipment) will be installed alongside the current STU (Secure Telephone Unit) bank. The STEs are Fortezza card-capable and can handle ISDN lines with data trans-mission speeds up to 128 kbps.

While all these advancements are being made to the R^{2}CIL communications and system infrastructure, the R^{2}CIL staff's number one priority will still be to support the Warfighter. The enhancements will be done in stages to ensure minimal impact to the ARAT users. We plan to make the transition during the upgrade as trans-parent as possible to the user. The second phase of this effort will include additional technologies such as software that will enable redundancy between the MSEWBBS (Multi-Service Electronic Warfare Bulletin Board System) located at Eglin AFB and the R^{2}CIL located at Fort Monmouth. Our goal is to supply the Warfighters with the information they need as quickly and easily as possible, no matter what time they need it. The 1999 R^{2}CIL will be transitioned into a state-of-the-art communications hub used to support the Warfighter into the 21st century. ■
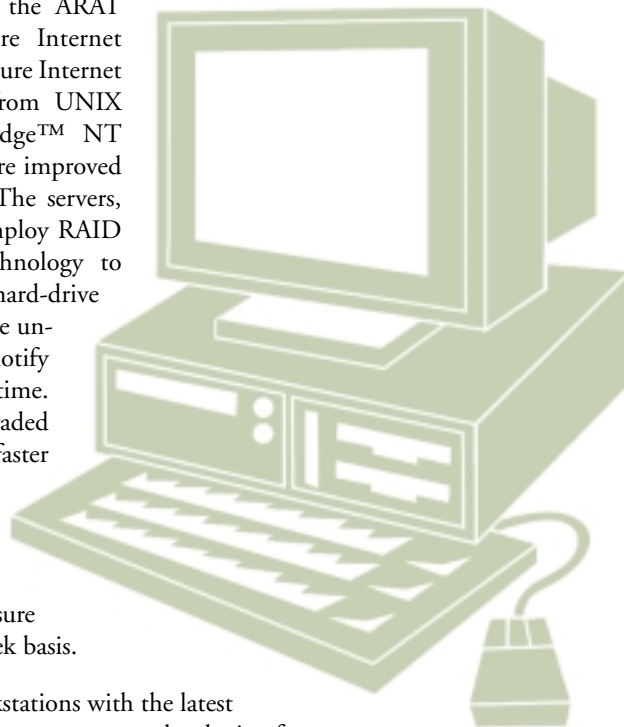
ARAT Flagging Goes Multi-Service

by Carl Brunner, SRI International

The ARAT flagging shop is no longer an "Army-only" place. As the AN/APR-39A(V)2 enters production, ARAT is preparing to provide the Marines with reprogramming support. Part of that support involves designing and building a new flagging model, which provides unique challenges and opportunities. ARAT will be working with another service and, for the first time, developing a flagging model at the same time the system enters its final testing.

Before it began supporting the A(V)2 system, ARAT performed flagging services for the Army alone. ARAT's entire focus was on the way the Army fought and what their battlefield was like. The battlefield environment plays a substantial role in determining what electronic warfare (EW) system responses are and are not acceptable. With the arrival of the A(V)2, a new service enters into ARAT's flagging responsibilities. This presents a challenge in that ARAT must learn and understand a new battlefield environment and way of fighting to provide quality flagging support. Although the Marines, the primary users of the A(V)2, are primarily a ground fighting force, their littoral environment and doctrine are vastly different from the Army's. Included in the mix are new types of emitters that the Army never sees and different threats to amphibious operations. Beyond the operational missions, the Marines provide rotary-winged transport for government VIPs, which requires yet another set of environmental considerations. The Marines introduce some challenges for ARAT, but they will be met before the A(V)2 is deployed.

The Navy has been very interested in the development of the A(V)2's reprogramming support capability. Recently, the Fleet Information Warfare Center (FIWC) sent a representative to Ft. Monmouth to attend a meeting on flagging model development. Eventually, the FIWC will be able to access the Conventional Flagging Data Base (CFDB) via SIPRNET and to interact with ARAT system programmers in developing new tactics, techniques, and procedures (TTP) for the Marine aviators. Fielding of the A(V)2 presents the Army and Navy with an excellent opportunity to expand their reprogramming cooperation. Joint cooperation between the services saves manpower and resources and improves interoperability of the forces.

U.S. Air Force Photo

The venerable UH-1 "Huey" served as the testbed for the A(V)2

With the Navy teaming up with ARAT before the A(V)2 is fielded, the flagging shop has the opportunity to design the flagging model as the system itself completes development--the ideal way to produce a flagging model. So, not only will the system be supported from the beginning of its fielding, the flagging model will be tested at the same time as the system. This development process has significant advantages. As the first A(V)2 was delivered to CECOM-SEC, the software engineers were in the process of developing the mission data generation software. The flagging shop at this point is able to help the software engineers design and produce the data file derived from the MDS that the flagging model uses. It is much easier and more efficient to design the file at this point, and the result is a data file that is tailored to the flagging engineer's requirements. In addition, the routines of the flagging model can be evaluated against the system's performance to improve the model's fidelity. In the case of the A(V)2, extensive lab testing determined how the crystal clock resolve and the processing of jittered signals would be modeled. Another advantage in concurrent development is the ability to use the system's test data and results to test the flagging model's fidelity. When completed, the flagging model will be tested using the same signals used to test the A(V)2 on the Echo Range. The output of both tests will be compared, from which an assessment of the fidelity can be made. This is the best possible way to test the flagging model and yields the greatest confidence in its performance.

Adding a Navy system to ARAT's support structure is a large, positive step. Bi-service cooperation will enhance ARAT's position in the EW community and expand its expertise beyond the Army's battlefield. Development and testing of the A(V)2 flagging model will serve as a benchmark for other EW programs. It demonstrates the results that can be achieved by incorporating reprogramming support for signature-sensitive systems into their design and production schedule.■

U.S. Air Force Photo

The APR-39A(V)2 will protect the Marines' new MV-22 tilt-rotor aircraft

Approximately 100 people—including CECOM's Commanding General, MG Robert L. Nabors, and Mr. Norm Svarrer, Team Chief of the ARAT-TA at Eglin AFB, FL—observed the demonstration. Mr. Joseph Ingrao, Chief of the CECOM SEC Electronic Combat (EC) Branch and Army Reprogramming Analysis Team-Project Office (ARAT-PO), briefed the crowd on the steps encompassing the reprogramming effort.

While Mr. Ingrao spoke to the crowd, a team of SEC engineers—using a commercial laptop computer and a small satellite terminal—established a satellite telephone link to a computer at Fort Monmouth that stored the software file needed to update the helicopter's AN/APR-39A(V)1 Radar Signal Detecting Set (RSDS), a device that alerts the aircrew of hostile radar activity in the area. After downloading the file in less than two minutes, the engineers terminated the satellite link, disconnected the laptop from the satellite terminal, then carried the laptop over to the Cobra helicopter and connected it to the RSDS using a CECOM SEC-developed interface cable. The team then reprogrammed the AN/APR-39A(V)1 with the updated software in less than a minute using a DOS-based program also developed by CECOM SEC in concert with the interface cable. [Note: The same program and cable are packaged together into a Reprogramming kit, which has been provided to U.S. Army Aviation units worldwide.]

"More time was spent waiting for the blades to stop turning than it took to accomplish the entire software download and installation process," said Mr. Ingrao at the conclusion of the live reprogramming demonstration. The crowd was then permitted to view the helicopter and ask questions about the overall process of the SEC team.

The development of the software file used to update the AN/APR-39A(V)1, known as a Mission Data Set (MDS), is a responsibil-

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ity of the CECOM SEC's EC Branch, which works in cooperation with the Army's Threat Analysis team located at Eglin Air Force Base, FL. Existing MDSs require periodic changes in response to the introduction of new radar systems and/or changes to current radar signals due to modifications or modernization efforts. New MDSs are produced when forces deploy to areas where no MDS exists that will provide coverage of the radar systems expected to be encountered. The level of effort necessary to develop MDSs varies. An existing MDS can normally be modified in hours to a few days, while a new MDS may take a week or more, depending on mission requirements.

Use of the Reprogramming kit has produced significant cost savings over the contact teams previously required to install software changes. Contact teams had to travel to each aircraft around the world, a process that took weeks or months to accomplish. Now, units leverage commercial technology to download MDS files from data servers located at Eglin AFB, FL, and install the changes themselves in just a few minutes.

The CECOM SEC EC Branch team assisting Mr. Joseph Ingrao at the Armed Forces Day event was composed of Messrs. Michael Crapanzano and Andrew Lombardo, L-3 Communications – Ilex Systems, and Ms. Tara Hurden and Mr. Jim Holland, SRI International.■

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MAJ Dennis Devery receiving a certificate of appreciation from John P. Hakim, Chief AIEW Division, for his contribution to the success of CECOM SEC's participation in Armed Forced Day 1999

ARAT-PO Goes to Germany to Prepare ESSO for Action

*by Pete McGrew, SRI International
and Marc C. Demarest, L-3 Communications Corp. — Ilex Systems*

Stepping off the MD-11 aircraft at Frankfurt International Airport and walking through the myriad of glass and highly polished stainless steel fixtures is like being on the set of a futuristic, sci-fi movie in Hollywood. Recently we had the opportunity to visit Frankfurt, Germany—more specifically, the U.S. Army Aviation facilities at Hanau and Ansbach—to support an on-going project funded by the Army Reprogramming Analysis Team-Project Office at Ft. Monmouth, NJ.

"So, Marc, this is Europe? I thought it rained all the time!"

Under this project, the ARAT-PO supports the European Software Support Office (ESSO) in establishing a capability to connect with, download, and use two established and well-proven media: the Multi-Service Electronic Warfare Bulletin Board System (MSEWBBS), managed out of Eglin AFB, FL, and the ARAT WEB, located at Ft. Monmouth, NJ. With the increasing tensions and operations in the Balkans, Mr. Joseph Ingrao (ARAT Project Officer) expanded our efforts on this trip to support not only the ESSO, but also the available Logistic Avionics Representatives (LARs) and soldiers who worked on, operated, or supported aviation Target Sensing Systems (TSS) in the European Theater.

The ESSO organization will provide an additional conduit to support TSS in addition to the grassroots structure that is on-going throughout the Army to access TSS data and other relevant information in direct support of the Army Aviation Electronic Warfare Officer (EWO).

Prior coordination with the LAR office at Ft. Monmouth and the ESSO Chief, Mr. Steve Cooper, stationed at Hammonds Barracks in Seckenheim, permitted us to quickly set up the hardware and software provisioned from the ARAT Project Office. We provided the ESSO with a ruggedized GETAC laptop computer, an MLV Kit, and an AT&T STU III—all the items the ESSO team will need to access and download any new Mission Data Sets (MDSs), get updated data on other systems, and also provide a secure means to send e-mails.

Mr. Ben Buhay (CECOM LAR) tries his hand at uploading an MDS into the AN/APR-39A(V)1

At Hanau and Ansbach, we were able to visit with soldiers from 1/1 CAV, 1-4 CAV, 1-501st, 2-501st 214 AVN BN, HHC 4 AVN BDE 1st AD, 1-1 AVN, 2-1 AVN, 7-159th AVN, and A CO 601st ASB. We presented briefings on the MSEWBBS, TSS, and the ARAT structure both in a classroom format and at the Aviation Intermediate Maintenance, where we also demonstrated how to upload Radar Signal Detecting Sets (RSDSs). We also demonstrated the MSEWBBS access through the SIPRNET at both locations. The saying that "timing is everything" proved somewhat prophetic. We were able to notify all the attending personnel that a new MDS for the AN/APR-39A(V)1 was in test and would probably be deployed within a week to support specific European operations. It was.
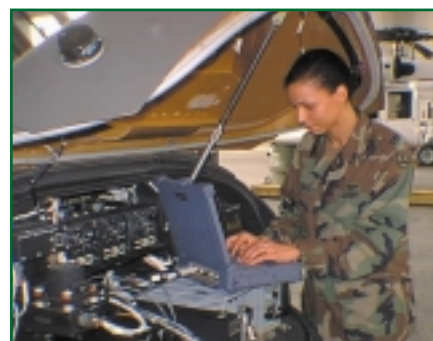
SSG Rachel Patrick (7-159th AVN) sees how easy it is to upload the AN/APR-39A(V)1

We received extensive assistance from Mr. Andy Poulter (TELOS Corp.), Mr. Ben Buhay (CECOM LAR), 1LT Derek I. McClain, S-2, 4th AVN BDE 1st AD, and 1LT Lorensen S-2, 4th Aviation Brigade, 1st Infantry Division. Their help made our visit productive and enjoyable. And yes—we enjoyed the beer, too! ■

Accessing the MSEWBBS to download an MDS

"No test—these classes are easy!"

Association of Old Crows Annual Symposium

Old Crows Witness New Tricks at FiestaCrow '99

by Tara Hurden, SRI International

Just as the ARAT's mission is to keep the U.S. Army Target Sensing Systems (ATSS) up to date with current threat data and the Army's EWOs knowledgeable on current reprogramming services available to them, it was the goal of CECOM Software Engineering Center to broaden the awareness of the government and military who participated in FiestaCrow '99 (18-21 April 1999, in San Antonio, TX). A semi-annual event sponsored by the Association of Old Crows, FiestaCrow '99 provided the perfect venue to enlighten the armed forces community on what ARAT does.

Although attendance at the exhibition was lower than expected, the ARAT's participation was beneficial. Presentations by two ARAT team members during the technical sessions proved to be an integral part in understanding how the ARAT began, where it's at, and where it's headed. Peter McGrew, SRI International, presented a paper entitled "Army Reprogramming—A Task On-Going." His presentation was followed by "Army Reprogramming Distribution—Leveraging Today's Technology to Support the Warfighter," given by Andrew Lombardo, L-3 Communications Corp. – Ilex Systems. Both papers were well received and sparked interest from both current and prospective customers.

Many of the participants who took time to watch the ARAT team demonstrate the downloading and reprogramming process were impressed with the cost-effectiveness of rapid reprogramming. From logging on to the Multi-Service Electronic Warfare Bulletin Board System (MSEWBBS), to downloading the proper Mission Data Set (MDS), to reprogramming the ATSS using a Memory Loader-Verifier Kit (MLV) (cable, software and instructions)—on-lookers were amazed at how quickly the process is done. The demonstrations caused one customer to consider using an ARAT-developed MLV kit over the more expensive industry-supplied MLVs.

Despite the low attendance, the ARAT's involvement at the conference was a success because of the teamwork of the ARAT and the goals jointly forged with the Warfighter.■

ATSS (Army Target Sensing Systems)

Army electronic systems, both offensive and defensive, that use some kind of signature (e.g., ELINT) to identify enemy equipment.

Box

Refers to an EW system. Originates from EW systems typically being housed in one or more metal boxes.

ELINT (Electronic Intelligence)

Radars emit radio signals with distinctive parameters that can be used to identify them. The parameters can be thought of as "fingerprints" for a particular type of radar. ELINT is the term applied to the parameters when they are collected.

EW (Electronic Warfare; also known as Electronic Combat)

Actions taken to ensure friendly use of the electromagnetic spectrum and to deny its use to the enemy.

EWIR (Electronic Warfare Integrated Reprogramming)

Refers to both the rapid reprogramming process and the name of a database that contains all the known ELINT parameters of enemy radars.

EWO (Electronic Warfare Officer)

Army aviation officer or warrant officer who is trained in EW and EW systems aboard Army aircraft. The training course is conducted at Ft. Rucker, AL.

Flagging

The process of searching for and identifying changes in enemy ELINT parameters. When a change is found, the signal is "flagged" for possible rapid reprogramming. This is the first step of the rapid reprogramming process.

FMS (Foreign Military Sales)

Sales of military equipment and services to friendly nations. ARAT is heavily involved in FMS of EW services to many nations.

MASINT (Measurement and Signatures Intelligence)

Intelligence derived from a signature analysis. Used to program an ATSS so it is able to identify the equipment by its signature.

MDS (Mission Data Set; also known as Emitter Identification Data [EID])

The data programmed into EW systems that is used to identify radars by their ELINT parameters. MDSs are developed using the EWIR database.

MLV (Memory Loader-Verifier)

A device (sometimes a laptop PC) that loads the MDSs into the EW box. Once an MDS is loaded in, the MLV verifies the MDS was not corrupted during the transfer.

MSEWBBS (Multi-Service Electronic Warfare Bulletin Board System)

A wide-area computer network that contains various MDSs for fielded EW systems. Its purpose is to distribute MDSs from the Reprogramming Center to the soldiers in the field.

OFP (Operational Flight Program)

The operating system of an EW box. Analogous to Windows 95 in a PC.

Rapid Reprogramming

The process of quickly changing the data that EW systems use to recognize enemy weapon system radars. These changes are made in response to the enemy altering its radars' ELINT parameters.

RSDS (Radar Signal Detecting Set; also known as a Radar Warning Receiver [RWR])

An electronic system that informs aircrews that a radar is targeting their aircraft. Modern RSDSs are able to identify the type of radar in most cases.

Signature Analysis

Analysis of a physical characteristic or emission of a piece of equipment. Examples are electromagnetic emissions, acoustic data, and how the equipment reflects radar energy of various frequencies.

Threat Analysis

Analysis of hostile forces to determine the sources and level of threats to a friendly platform (e.g., Army helicopters). Provides the basis for ARAT-TA to develop an MDS.

UDM (User Data Module)

A small integrated circuit card that fits into the EW box. Contains the MDS on memory chips. If no MLVs are available, boxes can be reprogrammed by installing a different UDM.

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For Your Information

Coming Events

Event/Sponsor	Location	Dates
AAAA Symposium	Orlando, FL	1 - 3 March 2000
Fiesta Informacion	San Antonio, TX	25 -27 March 2000
AOC International Conference	Zurich, Switzerland	20 - 24 May 2000

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